

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE*In re* Application of:

BEFORE THE EXAMINER:

Christopher et al.

Unassigned

Serial No.: Divisional of USSN 09/408,050 Group Art Unit No.: Unassigned

Filed:

Attorney Docket No.: 98B054-4

For: *Cationic Group-3 Catalyst System*Baytown, Texas
November 29, 2001**BOX PATENT APPLICATION**
Assistant Commissioner for Patents
Washington, D.C. 20231**PRELIMINARY AMENDMENT UNDER 37 C.F.R. § 1.115**

Assistant Commissioner for Patents:

AMENDMENT**In The Specification:**

Please amend the specification to read as follows. Marked-up versions of the amended paragraphs are attached in APPENDIX A: "Marked-Up Specification". Please replace the paragraph that begins on page 1 line 8, with the following paragraph:

--This application is a Divisional of U.S. Application Ser. No. 09/408050, filed on September 29, 1999. Application 09/408050 claims priority from U.S. Provisional Application Ser. No. 60/102,420, filed September 30, 1998.--

In The Claims:

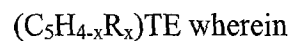
Please amend the claims to read as follows. A marked-up version of the claims is attached in APPENDIX B: "Marked-Up Claims ".

14. (amended once) A process for olefin polymerization comprising contacting, under olefin polymerization conditions, one or more olefin monomers with an activated Group-3 or Lanthanide metal stabilized by
- a) a monoanionic bidentate ligand, and
 - b) two monoanionic ligands,

wherein the bidentate ligand and the metal form a metallocyclic ring comprising at least five atoms.

Please add the following new claims:

17. (New) The process for olefin polymerization of claim 14 wherein the metal comprises scandium or yttrium.
18. (New) The process for olefin polymerization of claim 14 wherein the bidentate ligand has the formula:



- a) x is a number from 0 to 4,
- b) each R is, independently, a radical selected from
 - (i) $\text{C}_1\text{-C}_{20}$ hydrocarbyl radicals,

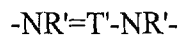
- (ii) C_1-C_{20} substituted hydrocarbyl radicals wherein one or more hydrogen atoms are replaced by a halogen atom, amido, phosphido, alkoxy or aryloxy or other Lewis-acid- or -base-containing radical,
- (iii) C_1-C_{20} hydrocarbyl-substituted Group-14 metalloid radicals, or
- (iv) halogen radicals,

or $C_5H_{4-x}R_x$ is a cyclopentadienyl ring wherein

- a) x is a number from 0 to 4,
- b) two adjacent R-groups are joined to form a C_4-C_{20} ring to give a saturated or unsaturated polycyclic cyclopentadienyl ligand;
- c) T is a covalent bridging group containing a Group-14 or -15 element;
- d) E is a π -donating ligand or JR'_z wherein
 - (i) J is an element from Group-15 or -16;
 - (ii) z is 2 when J is a Group-15 element and 1 when J is a Group-16 element;
 - (iii) each R' is independently a radical selected from
 - C_1-C_{20} hydrocarbyl radicals,
 - a substituted C_1-C_{20} hydrocarbyl radical wherein one or more hydrogen atoms is replaced by a halogen atom, amido, phosphido, alkoxy or aryloxy or other Lewis-acid- or -base-containing radical or

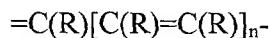
- C₁-C₂₀ hydrocarbyl-substituted, Group-14 metalloid radicals.

19. (New) The process for olefin polymerization of claim 14 wherein the ancillary ligand has the formula:

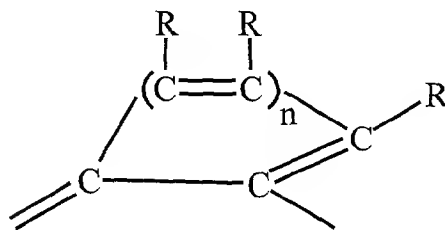


wherein

- N is nitrogen,
- T' is a covalent bridging group selected from



and



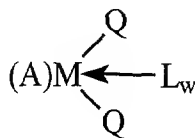
wherein each R is, independently, a radical selected from

- C₁-C₂₀ hydrocarbyl radicals,
- C₁-C₂₀ substituted hydrocarbyl radical wherein one or more hydrogen atoms is replaced by a halogen atom, amido, phosphido, alkoxy or aryloxy or other Lewis-acid- or -base-containing radical,

- (iii) C₁-C₂₀ hydrocarbyl-substituted Group-14 metalloid radicals,
- (iv) halogen radicals, or
- (v) two adjacent R groups are joined to form a C₄-C₂₀ ring, except that R independently may also be hydrogen except for R groups attached to the carbon atoms directly bonded to the nitrogen atoms, and
- (vi) n is 1, 2, 3, or 4.

20. (New) A process for olefin polymerization comprising:

- a) activating a metal complex to a cationic form, wherein the metal complex comprises a Group-3 or Lanthanide metal complex of the formula



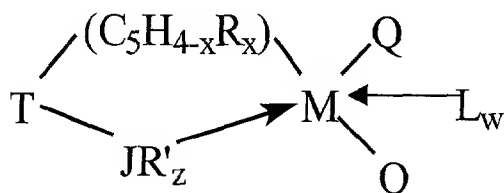
wherein,

- (i) M is a Group-3 or Lanthanide metal;
- (ii) A is a monoanionic bidentate ancillary ligand which forms a metallocycle with at least 5 primary atoms;
- (iii) each Q is independently a monoanionic ligand;
- (iv) L is a neutral Lewis base; and
- (v) w is a number from 0 to 3;

and

- b) contacting one or more olefin monomers with the activated metal complex under olefin polymerization conditions.

21. (New) The process for olefin polymerization of claim 20, wherein the Group-3 or Lanthanide metal complex has the formula



wherein

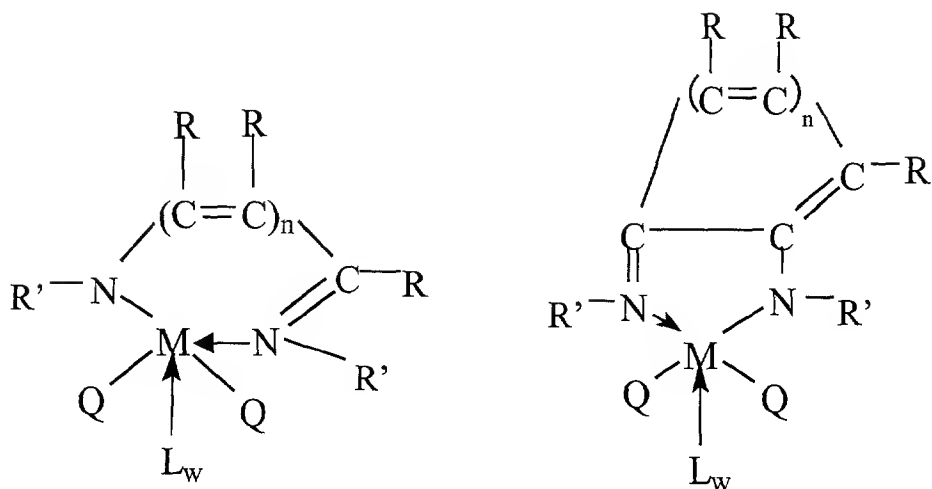
- a) M is a Group-3 or Lanthanide metal;
- b) $\text{C}_5\text{H}_{4-x}\text{R}_x$ is a cyclopentadienyl ring covalently π -bound to M and substituted with from zero to four substituent groups R;
- c) x is a number from 0 to 4 denoting the degree of substitution of $\text{C}_5\text{H}_{4-x}\text{R}_x$;
- d) each R is, independently, a radical selected from $\text{C}_1\text{-C}_{20}$ hydrocarbyl radicals, $\text{C}_1\text{-C}_{20}$ substituted hydrocarbyl radicals wherein one or more hydrogen atoms are replaced by a halogen atom, amido, phosphido, alkoxy or aryloxy or other Lewis-acid- or -base-containing radical, $\text{C}_1\text{-C}_{20}$ hydrocarbyl-substituted metalloid radicals wherein the metalloid is selected from Group-14 elements, and halogen radicals, or $\text{C}_5\text{H}_{4-x}\text{R}_x$ is a cyclopentadienyl ring in which two adjacent R-groups are joined to form a $\text{C}_4\text{-C}_{20}$ ring to give a saturated or unsaturated polycyclic cyclopentadienyl

ligand which may be additionally substituted with one or more R groups;

- e) T is a covalent bridging group containing a Group-14 or -15 element;
 - f) J is a Group-15 or -16 element;
 - g) z is 2 when J is a Group-15 element and 1 when J is a Group-16 element;
 - h) each R' is independently a radical selected from C₁-C₂₀ hydrocarbyl radicals, substituted C₁-C₂₀ hydrocarbyl radicals wherein one or more hydrogen atoms is replaced by a halogen atom, and C₁-C₂₀ hydrocarbyl-substituted metalloid radical wherein the metalloid is selected from Group-14 elements; and
 - i) each Q is independently a univalent anionic ligand.
22. (New) The process for olefin polymerization of claim 21 wherein M is scandium, yttrium or lanthanum.
23. (New) The process for olefin polymerization of claim 21 wherein T is a dialkyl, alkylaryl or diaryl silicon or germanium radical.
24. (New) The process for olefin polymerization of claim 21 wherein T is alkyl or aryl phosphine or amine radical or a hydrocarbyl radical.
25. (New) The process for olefin polymerization of claim 21 wherein J is oxygen, sulfur, nitrogen or phosphorus.
26. (New) The process for olefin polymerization of claim 21 wherein J is nitrogen.

27. (New) A process for olefin polymerization comprising

- a) activating a Group-3 or Lanthanide metal complex to a cationic form wherein the metal complex has one of the formulas:



wherein

- (i) M is a Group-3 or Lanthanide metal;
- (ii) each R is independently hydrogen, halogen, a C₁-C₂₀ hydrocarbyl, or a substituted C₁-C₂₀ hydrocarbyl wherein one or more hydrogen atoms is replaced by a halogen atom, amido, phosphido, alkoxy or aryloxy or other Lewis-acid- or -base-containing radical, C₁-C₂₀ hydrocarbyl-substituted metalloid radical wherein the metalloid is selected from Group-14 elements, or two adjacent R-groups are joined to form a C₄-C₂₀ ring, except that R independently may also be hydrogen except for R groups attached to the carbon atoms directly bonded to the nitrogen atoms;
- (iii) n is 1, 2, 3, or 4;
- (iv) each Q is independently a monoanionic ligand;

(v) L is a neutral Lewis base; and

(vi) w is a number from 0 to 3;

and

b) contacting one or more olefin monomers with the activated metal complex under olefin polymerization conditions.

28. (New) The complex of claim 27 wherein M is scandium, yttrium, or lanthanum.

Please cancel claims 1-12 and 15-16 without prejudice.

REMARKS

- Claims 13, 14, and 17-28 are pending in this Application.

All claims are believed to be in condition for allowance.

Please contact me if you think doing so will be helpful.

Respectfully submitted,

11/29/01

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APPENDIX A

SPECIFICATION MARKED-UP TO SHOW CHANGES

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TITLE : CATIONIC GROUP 3 CATALYST SYSTEM

INVENTORS: Joseph N. Christopher, Kevin R. Squire, Jo Ann M. Canich, Timothy D. Shaffer

RELATED APPLICATIONS

This application claims priority from an earlier filed application 60/102,420, filed September 30, 1998.

FIELD OF THE INVENTION

This invention relates to certain transition metal compounds from Group 3 of the Periodic Table of Elements, and to a catalyst system comprising a Group 3 or Lanthanide transition metal compound and alumoxane, modified alumoxane, non-coordinating anion activator, Lewis acid, or the like to form an active cationic catalyst species for the production of polyolefins such as polyethylene, polypropylene and alpha-olefin copolymers of ethylene and propylene having a high molecular weight.

BACKGROUND OF THE INVENTION

Neutral scandium compounds having two univalent ancillary ligands or a bidentate, divalent ancillary ligand are known from Shapiro et al., Organometallics, vol. 9, pp. 867-869 (1990); Piers et al., J. Am. Chem. Soc., vol. 112, pp. 9406-9407 (1990); Shapiro et al., J. Am. Chem. Soc., vol. 116, pp. 4623-4640 (1994); Hajela et al., Organometallics, vol. 13, pp. 1147-1154 (1994); and U.S. Patent 5,563,219 to Yasuda et al. Similar yttrium, lanthanum and cerium complexes are disclosed in Booi et al., Journal of Organometallic Chemistry, vol. 364, pp. 79-86 (1989) and Coughlin et al., J. Am. Chem. Soc., vol. 114, pp. 7606-7607 (1992). Similar polymerizations with a metal scandium complex having a bidentate, divalent ancillary ligand using a non-ionizing cocatalyst is known from U.S. Patent 5,464,906 to Patton et al.

Group 3-10 metallocyclic catalyst complexes are described in U.S. Patents 5,312,881 and 5,455,317, both to Marks et al.; U.S. Patent 5,064,802 to Stevens et al.; and EP 0 765 888 A2.

APPENDIX B

CLAIMS MARKED-UP TO SHOW CHANGES

n is 1, 2, 3 or 4;

each Q is independently a monoanionic ligand;

L is a neutral Lewis base; and

w is a number from 0 to 3.

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13. The complex of claim 10 wherein M is scandium, yttrium, or lanthanum.

14. A process for olefin polymerization comprising contacting one or more olefin monomers with the catalyst system of any one of the claims 1-4 under olefin polymerization conditions. *{copy in limitation of Claim 1}*

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15. A process for olefin polymerization comprising activating the metal complex of any one of claims 5-11 to a cationic form and contacting one or more olefin monomers therewith under olefin polymerization.

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16. A process for olefin polymerization comprising activating the metal complex of any one of claims 12 and 13 to a cationic form and contacting one or more olefin monomers therewith under olefin polymerization.